PROBLEMS.

18. **Proposed by ALFRED HUME, C. E., D. Sc., Professor of Mathematics, University of Mississippi, University, Mississippi.**

An elliptic paraboloid whose equation is $\frac{y^2}{a}+\frac{x^2}{b}=2z$ has its axis vertical and vertex downward. If μ be the co-efficient of friction, prove that a heavy particle will rest at any point of the surface below its intersection with the cylinder $\frac{y^2}{a^2}+\frac{x^2}{b^2}=\mu^2$.

19. **Proposed by H. C. WHITAKER, B. Sc., M. E., Professor of Mathematics, Manual Training School, Philadelphia, Pennsylvania.**

"There was an old woman tossed up in a basket,
Ninety times as high as the moon."

What was her initial velocity, the resistance of the air being neglected?

DIOPHANTINE ANALYSIS.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

SOLUTIONS TO PROBLEMS.

15. **Proposed by M. A. GRUBER, M. A., War Department, Washington, D. C.**

(a) The *difference* of two *odd* squares is always divisible by 8. Corollary: Every odd square is of the form $8a+1$

(b) The *sum* of two *odd* squares is two times an *odd* number.

I. **Solution by ARTEMAS MARTIN, LL. D., U. S. Coast and Geodetic Survey Office, Washington, D. C.**

(a) Every odd number is either of the form $4m+1$ or of the form $4m+3$.

$$(4m+1)^2=16m^2+8m+1=8(2m^2+m)+1;$$
$$(4m+3)^2=16m^2+24m+1=8(2m^2+3m)+1.$$

Hence every odd square is of the form $8a+1$, and any two odd squares may be represented by $8p+1$ and $8q+1$; their difference is $8p-8q=8(p-q)$.

(b) $(8p+1)+(8q+1)=8p+8q+2=2(4p+4q+1)$
$$=2[2(2p+2q)+1]=2[4(p+q)+1].$$